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(54) **Pipe couplings**

(57) A pipe coupling of the type comprising a body member A, a nut member B screwing onto the body member A, and front and rear ferrules C, D for mounting on a pipe between the body and nut members, has a convexly tapering leading end 5 of the front ferrule C contacting a straight tapered converging wall 2 in the body member A, a convexly tapering leading end 7 of the rear ferrule D contacting a straight tapered mouth 6 in the trailing end of the front ferrule C, and a convexly tapering trailing end 8 of the rear ferrule D contacting a straight bevel 9 in the inner end of the nut member.

The angle of the converging wall 2 in the body member is between 12° and 20° to the axis, preferably 15°, the angle of the tapering mouth 6 in the front ferrule is 45° to the axis, and the angle of the bevel 9 in the nut member is between 75° and 80° to the axis, preferably 77°.

The front ferrule is thickened around the tapering mouth, being stepped up from the larger end of the leading end, which curves to a flat annular front end face the inner edge of which bites into an inserted pipe.

The rear ferrule is stepped up between the larger end of the leading end and the larger end of the trailing end, and the leading end curves to an edge which bites into an inserted pipe.

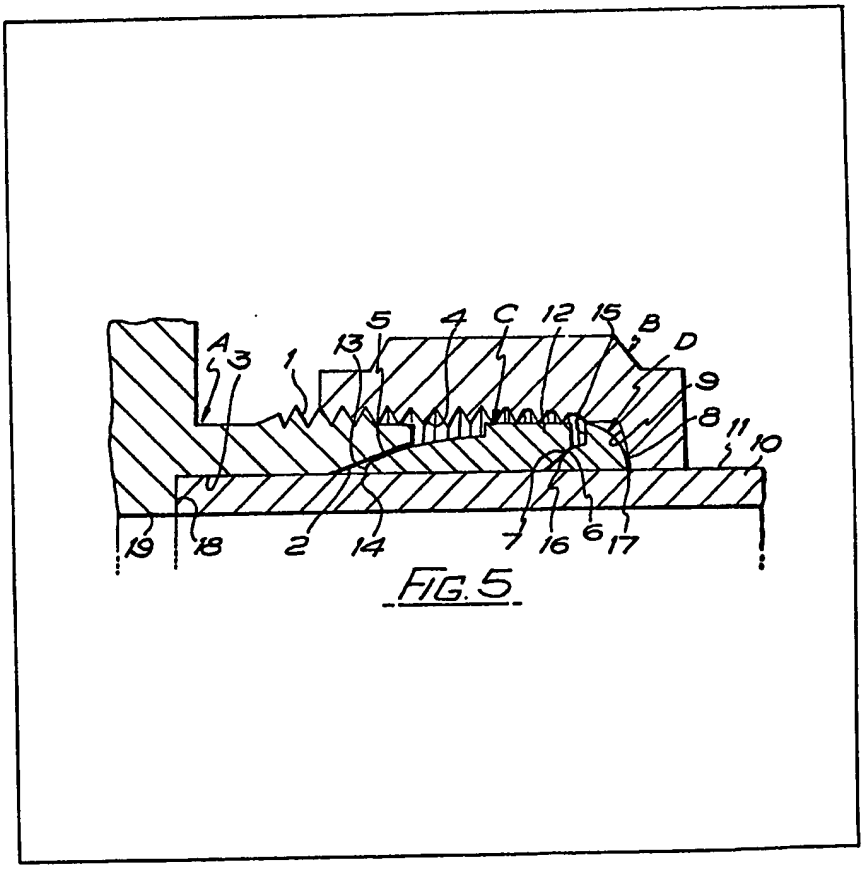

FIG. 5

GB 2 049 853 A

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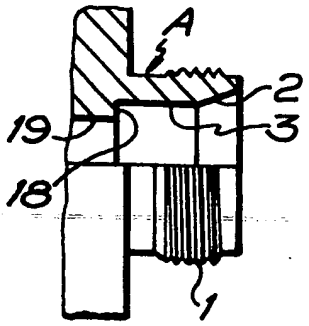

FIG.1

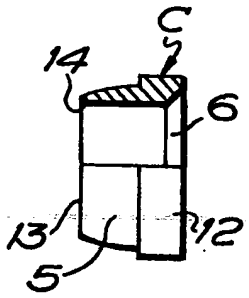

FIG.2

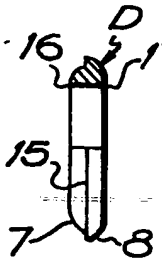

FIG.3

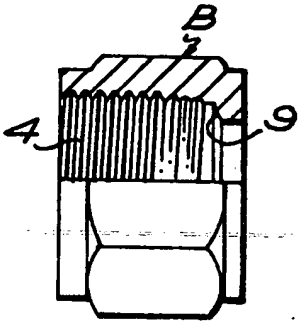

FIG.4

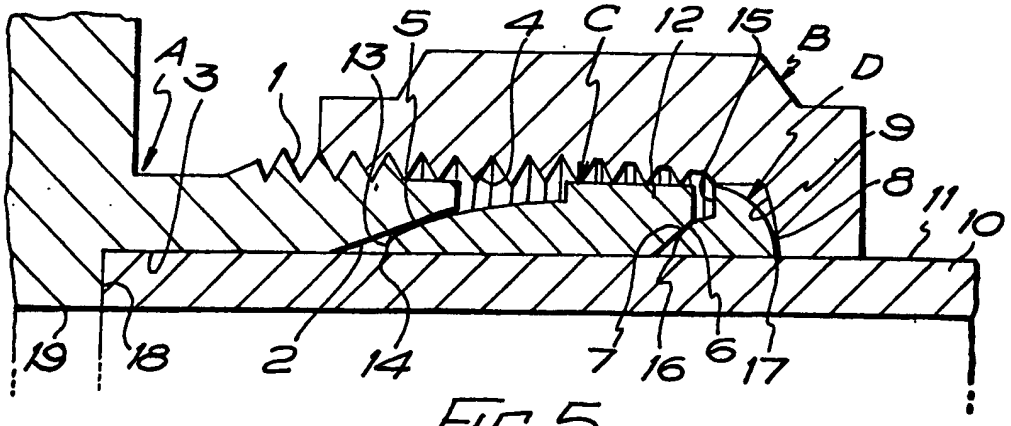

FIG.5

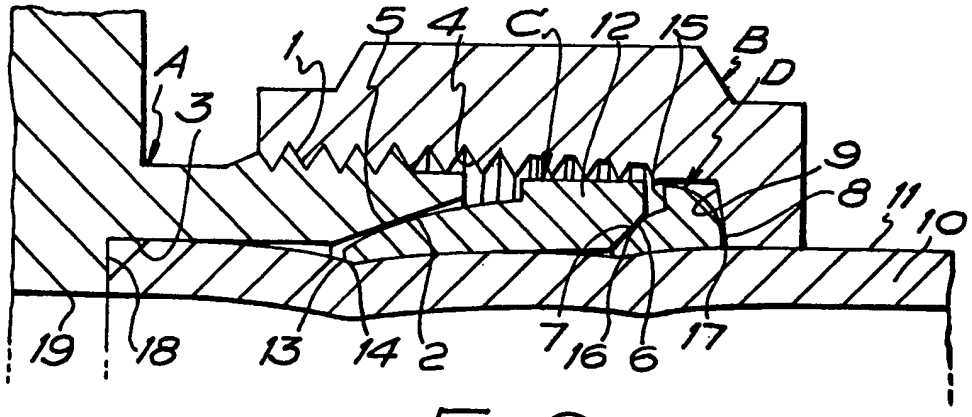

FIG.6

SPECIFICATION
Pipe couplings

This invention relates to pipe couplings of the type comprising a body member having an external screw-thread and an axially-disposed internal wall converging towards a bore for receiving an end of a pipe to be secured in the coupling, a nut member for mounting on a pipe and having a screw-thread fitting the screw-thread on the body member, and front and rear deformable ferrules for mounting on a pipe between the body and nut members, the front ferrule having an externally tapered leading end for contacting the converging wall in the body member and an inwardly tapering mouth at the trailing end, the rear ferrule having an externally tapered leading end for contacting the tapered mouth of the front ferrule and an externally tapered trailing end, and the nut member having an annular bevel at the inner end of the screw-thread for contacting the trailing end of the rear ferrule, whereby, when the body and nut members are in position around a pipe with the ferrules therebetween, screwing of the nut and body members together forces the leading end of the front ferrule into the convergent space between the converging wall in the body member and the outer surface of the pipe, and thereby compresses radially the leading end of the front ferrule so that it grips the pipe, and the leading end of the rear ferrule is forced into the tapering mouth in the trailing end of the front ferrule, and thereby compresses radially the leading end of the rear ferrule so that it too grips the pipe. The angle of the tapering mouth of the front ferrule is appreciably greater than the angle of the converging internal wall of the body member, so that the leading end of the front ferrule grips the pipe before the leading end of the rear ferrule, the rise in the effort required to tighten the nut and body members when the leading end of the rear ferrule grips the pipe being an indication that the leading end of the front ferrule is gripping the pipe sufficiently to provide a satisfactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling. Such a coupling will be called hereinafter "a coupling of the type referred to".

As the leading end of the front ferrule begins to grip the pipe, friction between the front ferrule and the body member, also between the rear ferrule and the front ferrule, and between the nut member and the rear ferrule increases and continues to increase as the grip increases, and may become so appreciable by the stage at which the leading end of the rear ferrule begins to grip the pipe that the rise in the effort required to tighten the nut and body members is not substantial enough to serve as an indication that the leading end of the rear ferrule is beginning to grip the pipe.

The object of the present invention, therefore, is to reduce friction in a coupling of the type referred to.

According to the present invention, in a coupling of the type referred to the converging internal wall of the body member, the tapering mouth in the front ferrule, and the annular bevel in the nut member all have straight longitudinal profiles, while the leading end of the front ferrule, the leading end of the rear ferrule, and the trailing end of the rear ferrule all have convex longitudinal profiles such that each convexly tapering surface initially fits into its respective straight tapering surface to make line contact therewith intermediate of its ends.

Thus, there is not anywhere, between the body member and the front ferrule, between the front ferrule and the rear ferrule, or between the rear ferrule and the nut member, at any time while the nut and body members are being tightened together, any appreciable surface contact to create high friction or increase friction, nor any possibility of a circumferential edge being brought into contact with a surface. Therefore, the rise in effort required to tighten the nut and body members when the leading end of the rear ferrule grips the pipe will be significant and will, accordingly, afford a very clear indication that the leading end of the front ferrule is gripping the pipe sufficiently to provide a satisfactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling.

The convexly tapering surfaces can be regarded as executing rolling sliding movement with respect to the respective straight tapering surfaces as the nut and body members are tightened. Alternatively, the longitudinal sections of the ferrules can be regarded as rocking inwardly with respect to the axis from their trailing ends to their leading ends.

The angle of the converging internal wall of the body member is preferably between 12° and 20° to the axis, more particularly 15°, the angle of the tapering mouth in the front ferrule is preferably 45° to the axis, and the angle of the bevel in the nut member is preferably between 75° and 80° to the axis, more particularly 77°.

The front ferrule preferably has a thicker portion around the tapering mouth in its trailing end, to afford increased resistance to stretching when the leading end of the rear ferrule is pushed into the tapering mouth in the front ferrule, the thicker portion preferably being stepped up from the larger end of the convexly tapering leading end, and the thicker portion preferably has a cylindrical outer surface. The leading end of the front ferrule preferably has a flat annular end face the inner edge of which is adapted to bite into the pipe. The rear ferrule preferably has a step up between the larger end of the leading end and the larger end of the trailing end, and the leading end of the rear ferrule preferably curves from the step to an edge which is adapted to bite into the pipe. The trailing end of the rear ferrule also preferably curves from the step to an edge, but this rear edge does not bite into the pipe.

The bore in the body member is preferably connected by an annular shoulder with a smaller bore, the annular shoulder serving as a stop for an inserted pipe.

A preferred embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which

Figures 1 to 4 are all half-sectional side elevations of respectively a body member, a front ferrule, a rear ferrule, and a nut member that together form a pipe coupling in accordance with the invention;

Figure 5 is a longitudinal section to a larger scale of one half of the coupling as initially assembled and with a pipe inserted; and

Figure 6 corresponds to Figure 5 but shows the coupling when the nut and body members have been screwed together until both ferrules grip the pipe.

The pipe coupling shown in the drawings comprises a body member A, having an external screw-thread 1 and an axially disposed internal wall 2 converging towards a bore 3 for receiving an end of a pipe to be secured in the coupling, a nut member B for mounting on a pipe and having a screw-thread 4 fitting the screw-thread 1 on the body member A, and front and rear deformable ferrules C, D, respectively, for mounting on a pipe between the body and nut members, the front ferrule C having an externally tapered leading end 5 for contacting the converging wall 2 in the body member A and an inwardly tapering mouth 6 at the trailing end, the rear ferrule D having an externally tapered leading end 7 for contacting the tapering mouth of the front ferrule and an externally tapered trailing end 8, and the nut member B having an annular member B having an annular bevel 9 at the inner end of the screw-thread 4 for contacting the trailing end of the rear ferrule, whereby, when the body and nut members A, B are in position around a pipe 10 (Figure 5) with the ferrules C, D, therebetween, screwing of the nut and body members together (Figure 6) forces the leading end 5 of the front ferrule C into the convergent space between the converging wall 2 in the body member A and the outer surface 11 of the pipe, and thereby compresses radially the leading end of the front ferrule so that it grips the pipe, and the leading end 7 of the rear ferrule D is forced into the tapering mouth 6 in the trailing end of the front ferrule C, and thereby compresses radially the leading end 7 of the rear ferrule so that it too grips the pipe. The angle of the tapering mouth 6 of the front ferrule C is appreciably greater than the angle of the converging internal wall 2 of the body member A, so that the leading end 5 of the front ferrule grips the pipe 10 before the leading end 7 of the rear ferrule, the rise in the effort required to tighten the nut and body members when the leading end 7 of the rear ferrule grips the pipe being an indication that the leading end 5 of the front ferrule is gripping the pipe sufficiently to provide a satisifactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling.

In accordance with the invention, the converging internal wall 2 of the body member A, the tapering mouth 6 in the front ferrule C, and the annular bevel 9 in the nut member B all have straight longitudinal profiles, while the leading end 5 of the front ferrule C, the leading end 7 of the rear ferrule D, and the trailing end 8 of the rear ferrule all have convex longitudinal profiles such that each convexly tapering surface intitially fits into its respective straight tapering surface to make line contact therewith intermediate its ends. Thus, there is not anywhere, between the body member A and the front ferrule C, between the front ferrule and the rear ferrule D, or between the rear ferrule and the nut member B, at any time while the nut and body members are being tightened together, any appreciable surface contact to create high friction or increase friction, nor any possibility of a circumferential edge being brought into contact with a surface. Therefore, the rise in effort required to tighten the nut and body members A, B when the leading end 7 of the rear ferrule D grips the pipe will be significant and will, accordingly, afford a very clear indication that the leading end 5 of the front ferrule C is gripping the pipe 10 sufficiently to provide a satisfactory seal of the coupling with the pipe, as well as holding the pipe against pulling out of the coupling.

The convexly tapering surfaces 5, 7 and 8 can be regarded as executing rolling sliding movement with respect to the respective straight tapering surfaces 2, 6 and 9 as the nut and body members A, B are tightened. Alternatively, the longitudinal sections of the ferrules C, D can be regarded as rocking inwardly with respect to the axis from their trailing ends to their leading ends.

The angle of the converging internal wall 2 of the body member A is 15° to the axis, the angle of the tapering mouth 6 in the front ferrule C is 45° to the axis, and the angle of the bevel 9 in the nut member B is 77° to the axis.

The front ferrule C has a thicker portion 12 around the tapering mouth 6 in its trailing end, to afford increased resistance to stretching when the leading end 7 of the rear ferrule D is pushed into the tapering mouth, the thicker portion being stepped up from the larger end of the convexly tapering leading end 5, and the thicker portion having a cylindrical outer surface. The leading end 5 of the front ferrule C has a flat annular end face 13 the inner edge 14 of which is adapted to bite into the pipe 10. The rear ferrule D has a step up 15 between the larger end of the leading end 7 and the larger end of the trailing end 8, and the leading end 7 curves from the step 15 to an edge 16 which is adapted to bite into the pipe 10. The trailing end 8 of the rear ferrule D also curves from the step 15 to an edge 17, but this rear edge does not bite into the pipe.

The bore 3 in the body member A is connected by an annular shoulder 18 with a smaller bore 19

(which preferably has, as shown, the same diameter as the bore of the pipe 10), the annular shoulder serving as a stop for the inserted pipe.

CLAIMS

1. A pipe coupling comprising a body member having an external screw-thread and an axially-disposed internal wall converging towards a bore for receiving an end of a pipe to be secured in the coupling, a nut member for mounting on a pipe and having a screw-thread fitting the screw-thread on the body member, and front and rear deformable ferrules for mounting on a pipe between the body and nut members, the front ferrule having an externally tapered leading end for contacting the converging wall in the body member and an inwardly tapering mouth at the trailing end, the rear ferrule having an externally tapered leading end for contacting the tapering mouth of the front ferrule and an externally tapered trailing end, and the nut member having an annular bevel at the inner end of the screw-thread for contacting the trailing end of the rear ferrule, the converging internal wall of the body member, the tapering mouth in the front ferrule, and the annular bevel in the nut member all having straight longitudinal profiles, while the leading end of the front ferrule, the leading end of the rear ferrule, and the trailing end of the rear ferrule, all have convex longitudinal profiles such that each convexly tapering surface initially fits into its respective straight tapering surface to make line contact therewith intermediate to its ends.

2. A pipe coupling as in Claim 1, wherein the angle of the converging internal wall of the body member is between 12° and 20° to the axis.

3. A pipe coupling as in Claim 2, wherein the angle of the converging internal wall of the body member is 15° to the axis.

4. A pipe coupling as in any one of the Claims 1 to 3, wherein the angle of the tapering mouth in the front ferrule is 45° to the axis.

5. A pipe coupling as in any one of Claims 1 to 4, wherein the angle of the bevel in the nut member is between 75° to 80° to the axis.

6. A pipe coupling as in Claim 5, wherein the angle of the bevel in the nut member is 77° to the axis.

7. A pipe coupling as in any one of Claims 1 to 6, wherein the front ferrule has a thicker portion around the tapering mouth in its trailing end.

8. A pipe coupling as in Claim 7, wherein the thicker portion is stepped up from the larger end of the convexly tapering leading end, and the thicker portion has a cylindrical outer surface.

9. A pipe coupling as in any one of Claims 1 to 8, wherein the leading end of the front ferrule has a flat annular end face the inner edge of which is adapted to bite into the pipe.

10. A pipe coupling as in any one of Claims 1 to 9, wherein the rear ferrule has a step up between the larger end of the leading end and larger end of the trailing end.

11. A pipe coupling as in Claim 10, wherein the leading end of the rear ferrule curves from the step to an edge which is adapted to bite into the pipe.

12. A pipe coupling as in any one of Claims 1 to 11, wherein the bore in the body member is connected by an annular shoulder with a smaller bore.

13. A pipe coupling substantially as hereinbefore described with reference to the accompanying drawings.

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